

BW3752-50B1

IEEE 802.11a/b/g/n/ac/ax 2T2R+Bluetooth 5.3 Combo Module

(Draft Version)



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1. Device Overview

1.1 Descriptions

The BW3752-50B1 is a highly integrated module that supports 2T2R 802.11 a/b/g/n/ac/ax with Wireless LAN (WLAN) SDIO3.0 interface controller and Bluetooth 5.3 HS-UART interface controller. It combined with BPSK, QPSK, 16QAM, 64QAM, 256QAM and up to 1024QAM modulation of the individual subcarriers, and compatible coding rate of 1/2, 2/3, 3/4, 5/6, provide up to 1201Mbps for IEEE 802.11ax MIMO OFDM. In addition, this compact module is a total solution for a combination of Wi-Fi + BT technologies. The module is specifically developed for tablet, OTT box and portable devices.

1.2 Features

1.2.1 General Features

- Supports VBAT range from 3.0V to 3.8V
- Security:
 - WPA, WPA2 (Personal) with security improvements, and WPA3 (Personal) support for powerful encryption and authentication
 - AES and TKIP in hardware for faster data encryption and IEEE 802.11i compatibility
- Worldwide regulatory support: Global products supported with worldwide homologated design, including IEEE802.11d/h support.
- Package:LGA-50Pin.15.0mm*13.0mm

1.2.2 Wi-Fi Key Features

- IEEE 802.11ax draft compliant.
- Dual-stream spatial multiplexing data rate of up to 1200 Mbps.
- 20/40/80 MHz channels with 1024-QAM modulation and an optional SGI.
- Two antennas
- Full IEEE 802.11a/b/g/n/ac legacy compatibility with enhanced performance.
- Client MU-MIMO.
- Supports standard SDIO v3.0, compatible with SDIO v2.0 HOST interfaces.

1.2.3 Bluetooth Key Features

- Complies with BT Core Specification Version 5.3 with support for future specifications.
- Bluetooth Class 1 or Class 2 TX operation.
- Supports multiple simultaneous Advanced Audio Distribution Profiles (A2DP) for stereo sound.

- Adaptive frequency hopping (AFH) to reduce radio frequency interference.
- Interface support: host controller interface (HCI) using a high-speed UART interface and PCM for audio data.

1.3 Functional Block Diagram

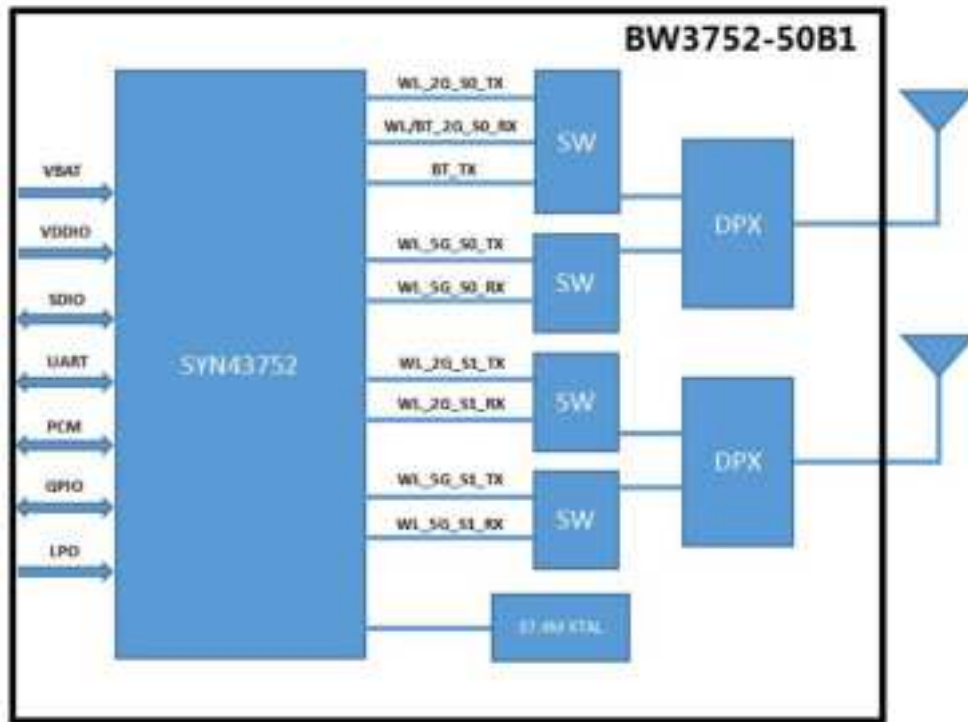


Figure 1. Block Diagram of BW3752-50B1

2. Pin Configuration and Functions

2.1 Module Pin Diagram

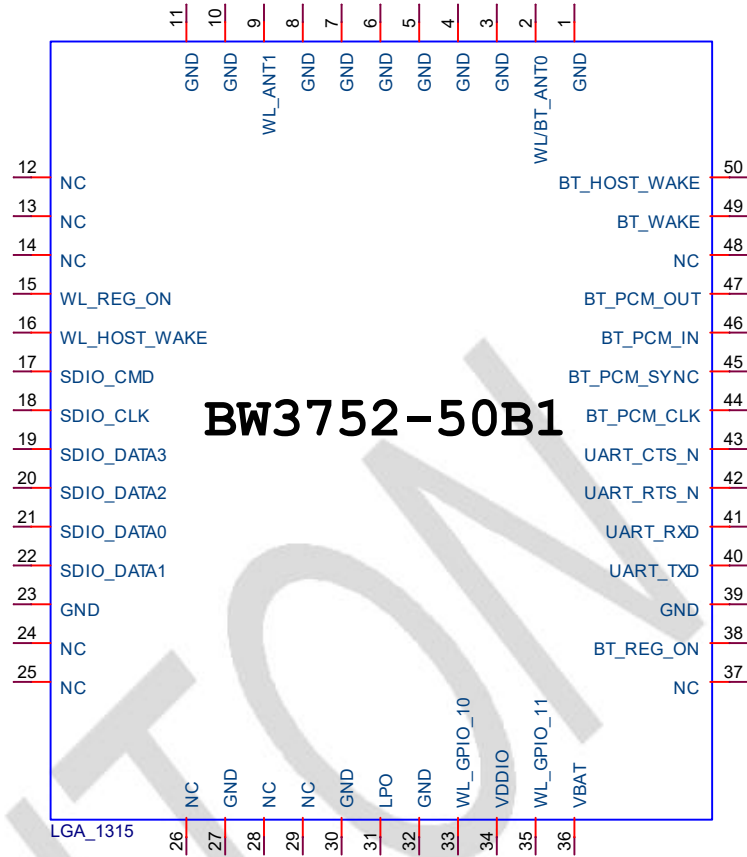


Figure 2.Pin Diagram of BW3752-50B1

2.2 Pin Functions

Pin	Name	Description
1	GND	Ground
2	WL/BT_ANT0	RF input/output of path S0 WLAN and BT
3	GND	Ground
4	GND	Ground
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	WL_ANT1	RF input/output of path S1 WLAN

10	GND	Ground
11	GND	Ground
12	NC	No connect, keep floating
13	NC	No connect, keep floating
14	NC	No connect, keep floating
15	WL_REG_ON	When this pin is high, the regulators are enabled and the WLAN section is out of reset. When this pin is low, the WLAN section is in reset.
16	WL_HOST_WAKE	WLAN wake up the host
17	SDIO_CMD	SDIO command line
18	SDIO_CLK	SDIO clock line
19	SDIO_DATA3	SDIO port data 3
20	SDIO_DATA2	SDIO port data 2
21	SDIO_DATA0	SDIO port data 0
22	SDIO_DATA1	SDIO port data 1
23	GND	Ground
24	NC	No connect, keep floating
25	NC	No connect, keep floating
26	NC	No connect, keep floating
27	GND	Ground
28	NC	No connect, keep floating
29	NC	No connect, keep floating
30	GND	Ground
31	LPO	External Low Power Clock input (32.768KHz)
32	GND	Ground
33	WL_GPIO_10	WL_GPIO_10
34	VDDIO	I/O power supply
35	WL_GPIO_11	WL_GPIO_11
36	VBAT	VBAT power supply
37	NC	No connect, keep floating
38		Used by PMU to power up or power down the internal

	BT_REG_ON	regulators used by the Bluetooth section. Also, when deasserted, this pin holds the Bluetooth section in reset.
39	GND	Ground
40	UART_TXD	High-Speed UART Data Out
41	UART_RXD	High-Speed UART Data In
42	UART_RTS_N	High-Speed UART RTS
43	UART_CTS_N	High-Speed UART CTS
44	BT_PCM_CLK	PCM clock
45	BT_PCM_SYNC	PCM sync signal
46	BT_PCM_IN	PCM data input
47	BT_PCM_OUT	PCM data output
48	NC	No connect, keep floating
49	BT_WAKE	Host wake up BT
50	BT_HOST_WAKE	BT wake up Host

3. Specifications

3.1 General Characteristics

Category	Descriptions
Dimension	L*W*H :15.0mm (±0.2mm)*13.0mm (±0.2mm)*2.4mm (±0.2mm)
Chip-set	SYN43752
Standard	IEEE 802.11a/b/g/n/ac/ax+BT 5.3
Modulation Type	CCK, DBPSK, DQPSK, OFDM, OFDMA
Frequency Band	2400~2500MHz,4900-5845MHz
Interface	WLAN: SDIO, Bluetooth: UART
Data Security	AES,WPA/WPA2/WPA3
Transmit Power	2.4G: 11b 1M:19.5±2dBm 11b 11M:19.5±2dBm 11g 6M: 19.5±2dBm 11g 54M:18±2dBm 11n HT20 MCS0:19.5±2dBm 11n HT20 MCS7:17.5±2dBm 11ax HE20 MCS0 19.5±2dBm 11ax HE20 MCS9 16.5±2dBm 5G: 11a 6M:16.5±2dBm 11a 54M:15.5±2dBm 11n HT20 MCS0:16.5±2dBm 11n HT20 MCS7:14.5±2dBm 11n HT40 MCS0:16±2dBm 11n HT40 MCS7:14.5±2dBm 11ac VHT20 MCS0:16.5±2dBm 11ac VHT20 MCS8:12±2dBm 11ac VHT40 MCS0:16±2dBm 11ac VHT40 MCS9:11±2dBm 11ac VHT80 MCS9:16±2dBm 11ac VHT80 MCS9:11±2dBm 11ax HE20 MCS11 16.5±2dBm 11ax HE20 MCS11 10±2dBm 11ax HE40 MCS0 16±2dBm 11ax HE40 MCS11 9±2dBm

	11ax HE80 MCS0 16±2dBm 11ax HE80 MCS11 9±2dBm
Rx Sensitivity	2.4G: 11b 11M:-89dBm@8% PER 11g 54M: -76dBm@10% PER 11n HT20 MCS7: -75dBm@10% PER 11ax HE20 MCS9: -70dBm@10% PER 5G: 11a 54M:-73dBm@10% PER 11n HT20 MCS7: -72dBm@10% PER 11n HT40 MCS7: -69dBm@10% PER 11ac VTH20 MCS8:-68dBm@10% PER 11ac VTH40 MCS9:-64dBm@10% PER 11ac VTH80 MCS9:-61dBm@10% PER 11ax HE20 MCS11:-57dBm@10% PER 11ax HE40 MCS11: -55dBm@10% PER 11ax HE80 MCS11: -53dBm@10% PER
Data Rate	802.11b [11,5.5,2 and 1Mbps] 802.11g [54,48,36,24,18,12,9&6Mbps] 802.11n HT20:up to 144.4Mbps 802.11n HT40:up to 300Mbps 802.11ac VHT80:up to 866.7Mbps 802.11ax HE20:up to 286.8Mbps 802.11ax HE40:up to 573.6Mbps 802.11ax HE80:up to 1201Mbps
Frequency Error	2.4GHz:<±25 ppm(11b),<±20 ppm(11g/n);5GHz:<±20 ppm
Ambient Temperature	-30℃~85℃
Storage Temperature	-40℃~125℃
Storage Humidity	Less than 60%
Antenna	External antenna
Operating System	Linux
Operating Voltage	VBAT:3.0V~3.8V(Typical:3.3V) VDDIO:1.62V~1.98V(Typical:1.8V)

3.2 RF Characteristics

All measurements are made under nominal supply voltage, room temperature and conducted conditions at

each antenna port rather than antenna.

3.2.1 Receiver RF Specifications

Parameter	Conditions		Min.	Nom.	Max.	Unit
Receive input frequency	802.11b/g/n/ax mode		2400	-	2500	MHz
Receiver sensitivity						
802.11b	1Mbps	FER<8%, Packet size= 1,024bytes	-	-	-82	dBm
	2Mbps		-	-	-80	dBm
	5.5Mbps		-	-	-78	dBm
	11Mbps		-	-	-76	dBm
802.11g	6Mbps	PER<10%, Packet size= 1,024bytes	-	-	-82	dBm
	9Mbps		-	-	-81	dBm
	12Mbps		-	-	-79	dBm
	18Mbps		-	-	-77	dBm
	24Mbps		-	-	-74	dBm
	36Mbps		-	-	-70	dBm
	48Mbps		-	-	-66	dBm
	54Mbps		-	-	-65	dBm
802.11n (HT20)	MCS0.	PER<10%, Packet size= 4,096bytes	-	-	-82	dBm
	MCS1.		-	-	-79	dBm
	MCS2		-	-	-77	dBm
	MCS3.		-	-	-74	dBm
	MCS4.		-	-	-70	dBm
	MCS5.		-	-	-66	dBm
	MCS6.		-	-	-65	dBm
	MCS7.		-	-	-64	dBm
802.11n (HT40)	MCS0.	PER<10%, Packet size= 4,096bytes	-	-	-79	dBm
	MCS1.		-	-	-77	dBm
	MCS2		-	-	-74	dBm
	MCS3.		-	-	-71	dBm
	MCS4.		-	-	-67	dBm
	MCS5.		-	-	-63	dBm
	MCS6.		-	-	-62	dBm
	MCS7.		-	-	-61	dBm
802.11ax	MCS0.	PER<10%,	-	-	-82	dBm

(HE20)	MCS1.	Packet size= 4,096bytes	-	-	-79	dBm
	MCS2		-	-	-77	dBm
	MCS3.		-	-	-74	dBm
	MCS4.		-	-	-70	dBm
	MCS5.		-	-	-66	dBm
	MCS6.		-	-	-65	dBm
	MCS7.		-	-	-64	dBm
	MCS8.		-	-	-59	dBm
	MCS9.		-	-	-57	dBm
	MCS10.		-	-	-54	dBm
	MCS11.		-	-	-52	dBm
Maximum input level						
802.11b	FER<8%		-10	-	-	dBm
802.11g	FER<10%		-20	-	-	dBm
802.11n	FER<10%		-30			dBm
802.11ax	FER<10%		-20			dBm

Parameter	Conditions		Min.	Nom.	Max.	Unit
Receive input frequency	802.11a/n/ac/ax mode		4900	-	5845	MHz
Receiver sensitivity						
802.11a	6Mbps	FER<10%, Packet size= 1,024bytes	-	-	-82	dBm
	9Mbps		-	-	-81	dBm
	12Mbps		-	-	-79	dBm
	18Mbps		-	-	-77	dBm
	24Mbps		-	-	-74	dBm
	36Mbps		-	-	-70	dBm
	48Mbps		-	-	-66	dBm
	54Mbps		-	-	-65	dBm
802.11n (HT20)	6Mbps	PER<10%, Packet size= 4,096bytes	-	-	-82	dBm
	9Mbps		-	-	-79	dBm
	12Mbps		-	-	-77	dBm
	18Mbps		-	-	-74	dBm
	24Mbps		-	-	-70	dBm
	36Mbps		-	-	-66	dBm
	48Mbps		-	-	-65	dBm
	54Mbps		-	-	-64	dBm

802.11n (HT40)	MCS0.	PER<10%, Packet size= 4,096bytes	-	-	-79	dBm
	MCS1.		-	-	-77	dBm
	MCS2		-	-	-74	dBm
	MCS3.		-	-	-71	dBm
	MCS4.		-	-	-67	dBm
	MCS5.		-	-	-63	dBm
	MCS6.		-	-	-62	dBm
	MCS7.		-	-	-61	dBm
802.11ac (VHT80)	MCS0.	PER<10%, Packet size= 4,096bytes	-	-	-76	dBm
	MCS1.		-	-	-73	dBm
	MCS2		-	-	-71	dBm
	MCS3.		-	-	-68	dBm
	MCS4.		-	-	-64	dBm
	MCS5.		-	-	-60	dBm
	MCS6.		-	-	-59	dBm
	MCS7.		-	-	-58	dBm
	MCS8.		-	-	-53	dBm
	MCS9.		-	-	-51	dBm
802.11ax (HE80)	MCS0.	PER<10%, Packet size= 4,096bytes	-	-	-76	dBm
	MCS1.		-	-	-73	dBm
	MCS2		-	-	-71	dBm
	MCS3.		-	-	-68	dBm
	MCS4.		-	-	-64	dBm
	MCS5.		-	-	-60	dBm
	MCS6.		-	-	-59	dBm
	MCS7.		-	-	-58	dBm
	MCS8.		-	-	-53	dBm
	MCS9.		-	-	-51	dBm
	MCS10.		-	-	-48	dBm
	MCS11.		-	-	-46	dBm
Maximum input level						
802.11a	FER<10%		-30	-	-	dBm
802.11n	FER<10%		-30	-	-	dBm
802.11ac	FER<10%		-30	-	-	dBm
802.11ax	FER<10%		-30	-	-	dBm

3.2.2 Transmitter RF Specifications

Parameter	Condition	Min.	Nom.	Max.	Unit.
802.11b/g/n/ax frequency	2.4GHz	2400	-	2500	MHz
Transmit power					
802.11b	1Mbps	17.5	19.5	21.5	dBm
	11Mbps	17.5	19.5	21.5	dBm
802.11g	6Mbps	17.5	19.5	21.5	dBm
	54Mbps	16	18	20	dBm
802.11n	HT20, MCS0	17.5	19.5	21.5	dBm
	HT20, MCS7	15.5	17.5	19.5	dBm
802.11ax	HE20, MCS0	17.5	19.5	21.5	dBm
	HE20, MCS9	14.5	16.5	18.5	dBm
Spectrum mask					
802.11b	$f_c - 22\text{MHz} < f < f_c - 11\text{MHz} \& f_c + 11\text{MHz} < f < f_c + 22\text{MHz}$	-	-	-30	dBr
	$f_c - 55\text{MHz} < f < f_c - 22\text{MHz} \& f_c + 22\text{MHz} < f < f_c + 55\text{MHz}$	-	-	-50	dBr
802.11g	$f_c \pm 9\text{MHz}$	-	-	0	dBr
	$f_c \pm 11\text{MHz}$	-	-	-20	dBr
	$f_c \pm 20\text{MHz}$	-	-	-28	dBr
	$f_c \pm 30\text{MHz}$	-	-	-40	dBr
802.11n	$f_c \pm 9\text{MHz}$	-	-	0	dBr
	$f_c \pm 11\text{MHz}$	-	-	-20	dBr
	$f_c \pm 20\text{MHz}$	-	-	-28	dBr
	$f_c \pm 30\text{MHz}$	-	-	-45	dBr
802.11ax (HE20)	$f_c \pm 9.75\text{MHz}$	-	-	0	dBr
	$f_c \pm 10.5\text{MHz}$	-	-	-20	dBr
	$f_c \pm 20\text{MHz}$	-	-	-28	dBr
	$f_c \pm 30\text{MHz}$	-	-	-40	dBr
Center frequency tolerance					
802.11b		-25	-	+25	pmm
802.11g/n/ax		-20	-	+20	pmm
EVM (Error Vector Magnitude)*					
802.11b	1Mbps	-	-	35	%
	2Mbps	-	-	35	%
	5.5Mbps	-	-	35	%

	11Mbps	-	-	35	%
802.11g	6Mbps	-	-	-5	%
	9Mbps	-	-	-8	dB
	12Mbps	-	-	-10	dB
	18Mbps	-	-	-13	dB
	24Mbps	-	-	-16	dB
	36Mbps	-	-	-19	dB
	48Mbps	-	-	-22	dB
	54Mbps	-	-	-25	dB
802.11n	MCS0.	-	-	-5	dB
	MCS1.	-	-	-10	dB
	MCS2	-	-	-13	dB
	MCS3.	-	-	-16	dB
	MCS4.	-	-	-19	dB
	MCS5.	-	-	-22	dB
	MCS6.	-	-	-25	dB
	MCS7.	-	-	-28	dB
802.11ax	MCS0.	-	-	-5	dB
	MCS1.	-	-	-10	dB
	MCS2	-	-	-13	dB
	MCS3.	-	-	-16	dB
	MCS4.	-	-	-19	dB
	MCS5.	-	-	-22	dB
	MCS6.	-	-	-25	dB
	MCS7.	-	-	-27	dB
	MCS8.	-	-	-30	dB
	MCS9.	-	-	-32	dB
	MCS10.	-	-	-35	dB
	MCS11.	-	-	-35	dB

Parameter	Condition	Min.	Nom.	Max.	Unit.
802.11a/n/ac/ax frequency	5GHz	4900	-	5845	MHz
Transmit power					
802.11a	6Mbps	14.5	16.5	18.5	dBm
	54Mbps	13.5	15.5	17.5	dBm
802.11n	HT20, MCS0	14.5	16.5	18.5	dBm

	HT20, MCS7	12.5	14.5	16.5	dBm
	HT40, MCS0	14	16	18	dBm
	HT40, MCS7	12.5	14.5	16.5	dBm
802.11ac	VHT20,MCS0	14.5	16.5	18.5	dBm
	VHT20,MCS8	10	12	14	dBm
	VHT40,MCS0	14	16	18	dBm
	VHT40,MCS9	9	11	13	dBm
	VHT80,MCS0	14	16	18	dBm
	VHT80,MCS9	9	11	13	dBm
802.11ax	HE20,MCS0	14.5	16.5	18.5	dBm
	HE20,MCS11	8	10	12	dBm
	HE40,MCS0	14	16	18	dBm
	HE40,MCS11	7	9	11	dBm
	HE80,MCS0	14	16	18	dBm
	HE80,MCS11	7	9	11	dBm
Spectrum mask					
802.11a	$f_c \pm 9\text{MHz}$	-	-	0	dBr
	$f_c \pm 11\text{MHz}$	-	-	-20	dBr
	$f_c \pm 20\text{MHz}$	-	-	-28	dBr
	$f_c \pm 30\text{MHz}$	-	-	-40	dBr
802.11n	$f_c \pm 9\text{MHz}$	-	-	0	dBr
	$f_c \pm 11\text{MHz}$	-	-	-20	dBr
	$f_c \pm 20\text{MHz}$	-	-	-28	dBr
	$f_c \pm 30\text{MHz}$	-	-	-45	dBr
802.11ac (VHT80)	$f_c \pm 39\text{MHz}$	-	-	0	dBr
	$f_c \pm 41\text{MHz}$	-	-	-20	dBr
	$f_c \pm 80\text{MHz}$	-	-	-28	dBr
	$f_c \pm 120\text{MHz}$	-	-	-40	dBr
802.11ax (HE80)	$f_c \pm 39.5\text{MHz}$	-	-	0	dBr
	$f_c \pm 40.5\text{MHz}$	-	-	-20	dBr
	$f_c \pm 80\text{MHz}$	-	-	-28	dBr
	$f_c \pm 120\text{MHz}$	-	-	-40	dBr
Center frequency tolerance					
802.11a/n/ac/ax		-20	-	+20	pmm
EVM (Error Vector Magnitude)*					
802.11a	6Mbps	-	-	-5	%

	9Mbps	-	-	-8	dB
	12Mbps	-	-	-10	dB
	18Mbps	-	-	-13	dB
	24Mbps	-	-	-16	dB
	36Mbps	-	-	-19	dB
	48Mbps	-	-	-22	dB
	54Mbps	-	-	-25	dB
802.11n	MCS0.	-	-	-5	dB
	MCS1.	-	-	-10	dB
	MCS2	-	-	-13	dB
	MCS3.	-	-	-16	dB
	MCS4.	-	-	-19	dB
	MCS5.	-	-	-22	dB
	MCS6.	-	-	-25	dB
802.11ac	MCS7.	-	-	-28	dB
	MCS0.	-	-	-5	dB
	MCS1.	-	-	-10	dB
	MCS2	-	-	-13	dB
	MCS3.	-	-	-16	dB
	MCS4.	-	-	-19	dB
	MCS5.	-	-	-22	dB
	MCS6.	-	-	-25	dB
	MCS7.	-	-	-27	dB
	MCS8.	-	-	-30	dB
802.11ax	MCS9.	-	-	-32	dB
	MCS0.	-	-	-5	dB
	MCS1.	-	-	-10	dB
	MCS2	-	-	-13	dB
	MCS3.	-	-	-16	dB
	MCS4.	-	-	-19	dB
	MCS5.	-	-	-22	dB
	MCS6.	-	-	-25	dB
	MCS7.	-	-	-27	dB
	MCS8.	-	-	-30	dB
	MCS9.	-	-	-32	dB
	MCS10.	-	-	-35	dB

	MCS11.	-	-	-35	dB
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3.2.3 Bluetooth RF Specifications

Parameter	Conditions	Minimum	Typical	Maximum	Unit
Frequency range		2402		2480	MHz
RX sensitivity	Sensitivity@BER=0.1% for GFSK(1Mbps)	-	-88	-	dBm
	Sensitivity@BER=0.01% for $\pi/4$ -DQPSK(2Mbps)	-	-91	-	dBm
	Sensitivity@BER=0.01% for 8DPSK (3Mbps)	-	-85	-	dBm
	Sensitivity@PER=30.8% for LE (1Mbps)	-	-90	-	dBm
	Sensitivity@PER=30.8% for 2LE (2Mbps)	-	-91	-	dBm
Output power	BDR	9	12	15	dBm
	EDR	6	9	12	dBm
	BLE	9	12	15	

3.3 DC Characteristics

3.3.1 Absolute Maximum Ratings

Symbol	Description	Value	Unit
VBAT	DC supply for VBAT	-0.5 to +5.0	V
VDDIO	DC supply voltage for digital I/O	-0.5 to 2.0	V

3.3.2 Recommended Operating Conditions and DC Characteristics

Symbol	Value			Unit
	Min	Typ	Max	

VBAT	3.0	3.3	3.8	V
VDDIO	1.62	1.8	1.98	V

The module requires two power supplies: VBAT and VDDIO.

Other Digital I/O Pins.

Symbol	Description	Value			Unit
		Min	Typ	Max	
VIH	Input high voltage	$0.65 \times VDDIO$			V
VIL	Input low voltage			$0.4 \times VDDIO$	V
VOH	Output high voltage @ 2 mA	$VDDIO - 0.40$			V
VOL	Output low voltage @ 2 mA			0.40	V

3.3.3 External clock reference

Parameter	Specification	Units
Nominal input frequency	32.768	kHz
Frequency accuracy	± 200	ppm
Duty cycle	30 - 70	%
Input signal amplitude	200 to 3300	mV, p-p
Signal type	Square-wave or sine wave	-
Input impedance ¹	>100k	Ω
	<5	pF

1. When power is applied or switched off.

4. Application and Implementation

4.1 Application Diagram

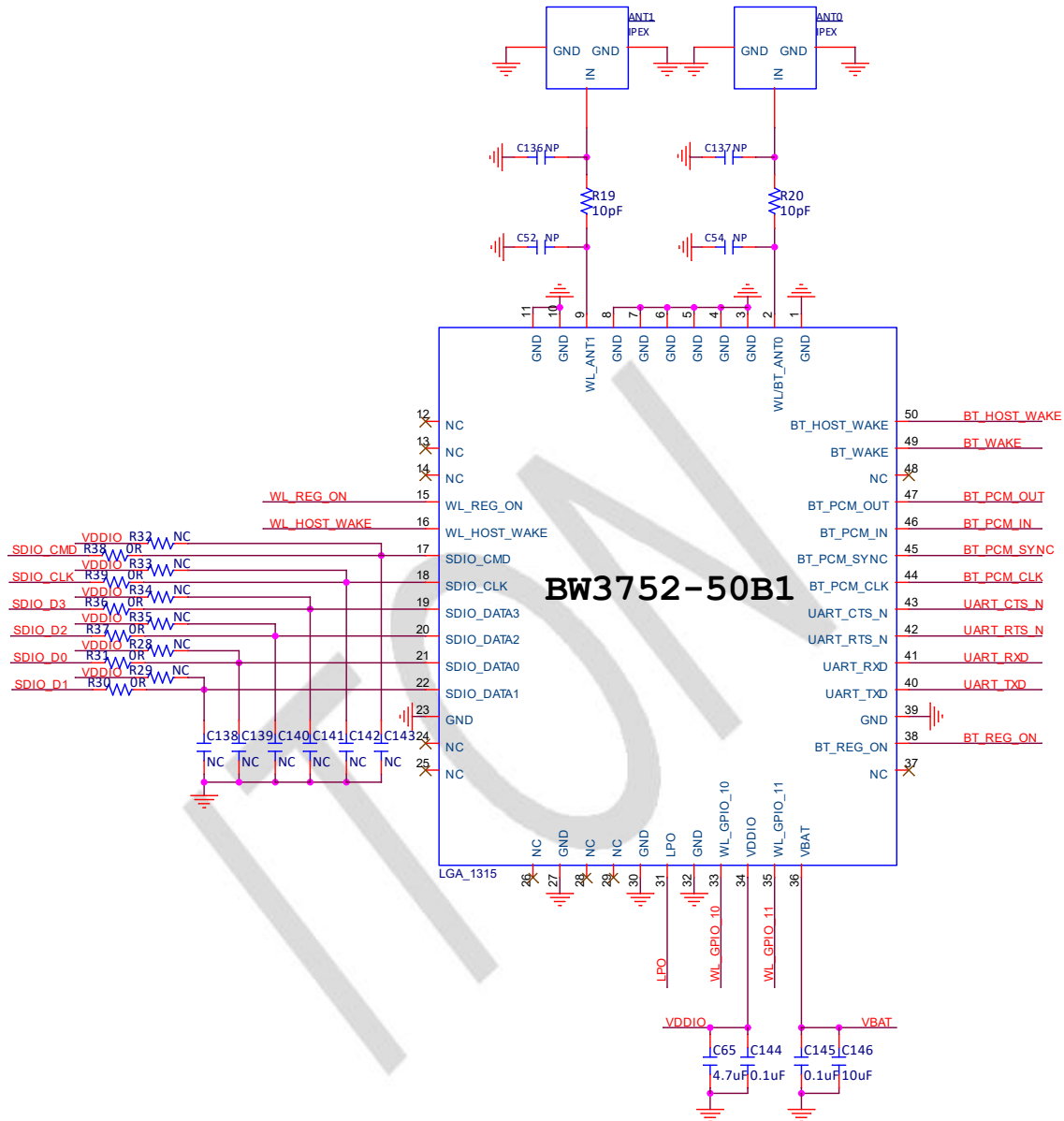


Figure 3. Application Schematic Diagram of BW3752-50B1

5. Mechanical and Package

5.1 Mechanical Size

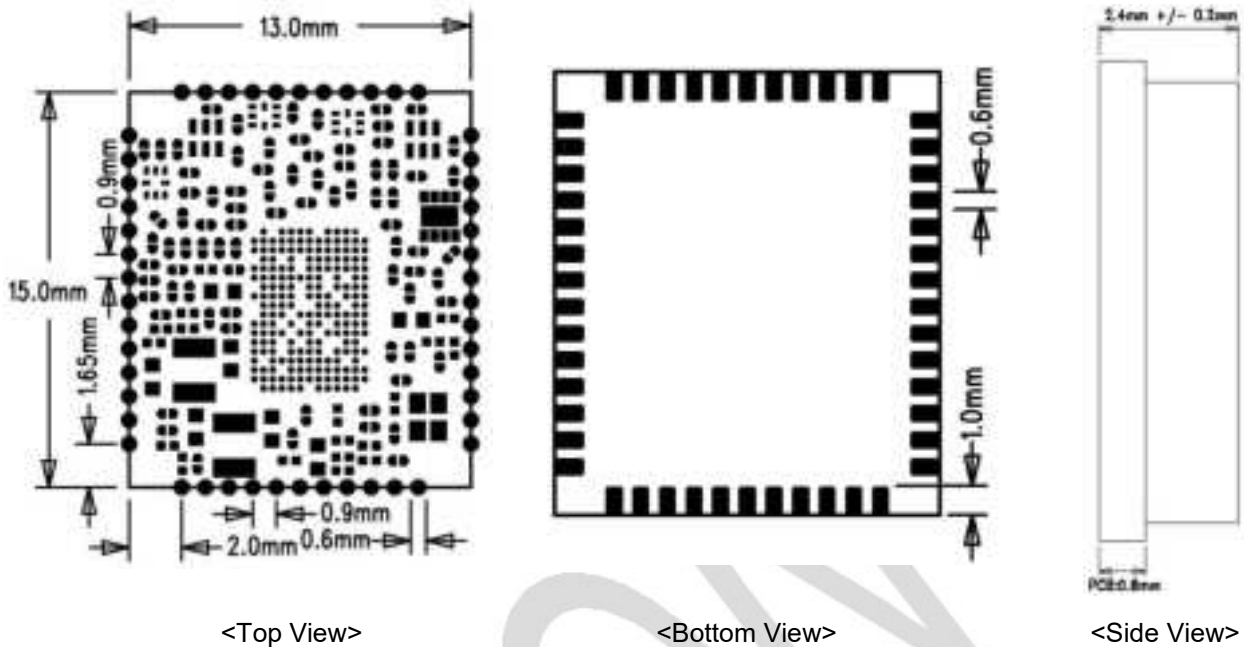


Figure 4. Mechanical Size of BW3752-50B1

5.2 Recommended Land Pattern

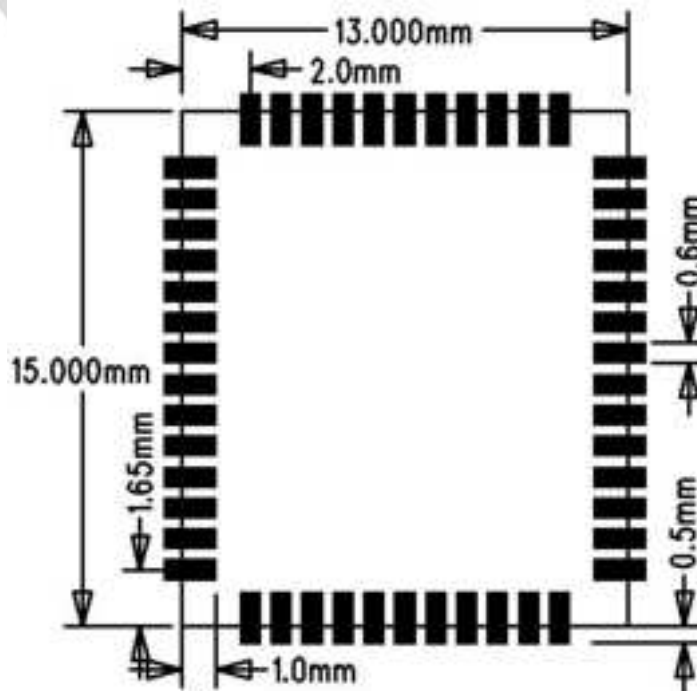


Figure 5. Recommended Land Pattern of BW3752-50B1

5.3 Package Information

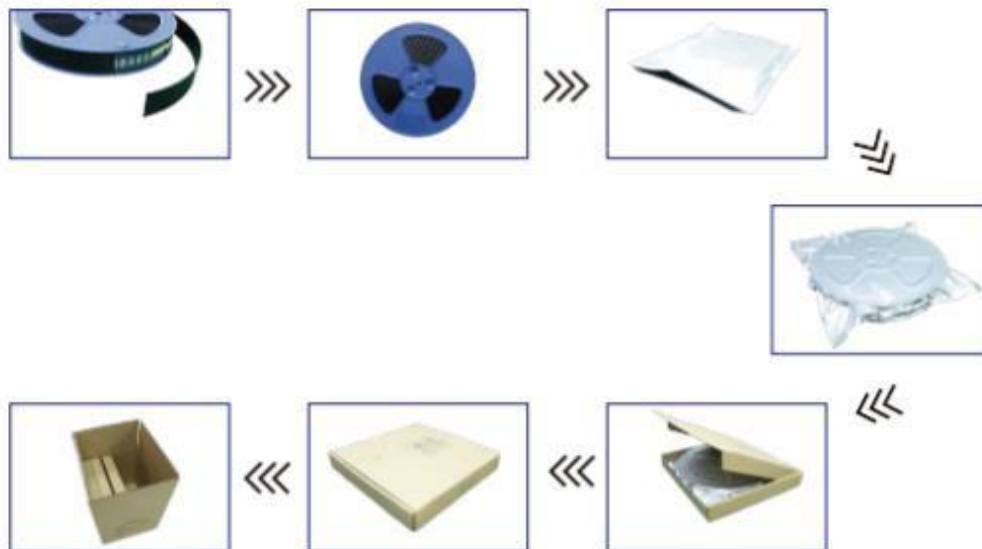


Figure 6. Brief Packaging Process of BW3752-50B1 Modules

6. Thermal Reflow

Referred to IPC/JEDEC standard.

Peak temperature: <250°C

Number of times: ≤2

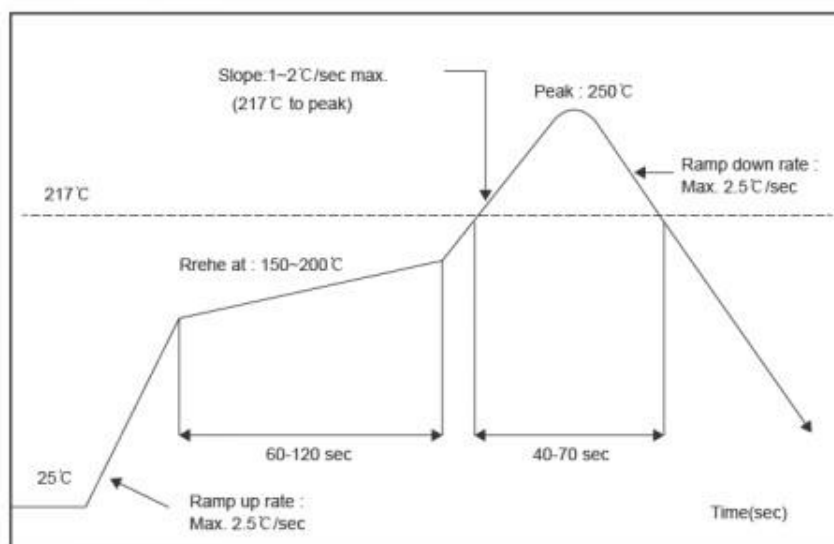


Figure 7. Recommended Reflow for Lead Free Solder

Note: The module is recommended not to go through reflow over twice.

7. Ordering Information

Part NO.	Working Voltage	ANT	Shielding Cover	Remark
BW3752-50B1	VBAT:3.0V~3.8V VDDIO:1.62V~1.98V	External antenna	Included	2 antennas

8. Revision History

Version	Change Content	Reviser	Date
V0.1	Draft Version	Phil Ye	2023.06.25
V0.2	Update BT to BT 5.2 Add DC Characteristics Add Module Picture	Phil Ye	2023.08.19
V0.2	Update BT5.2 to BT 5.3	Phil Ye	2023.08.22

FCC Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment

*RF warning for Mobile device:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

The OEM must certify the final end product to comply with unintentional radiators (FCC Sections 15.107 and 15.109) before declaring compliance of the final product to Part 15 of the FCC rules and regulations. Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change.

The OEM must comply with the FCC labeling requirements. If the module's label is not visible when installed, then an additional permanent label must be applied on the outside of the finished product which states: "Contains transmitter

module FCC ID: VYVBW3752-50B1 ”.

Additionally, the following statement should be included on the label and in the final product’s user manual:

“This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interferences, and

(2) this device must accept any interference received, including interference that may cause undesired operation.” The module is limited to installation in applications. Separate approval is required for all other operating configurations, including portable configuration with respect to Part 2.1093 and different antenna configurations. A module or modules can only be used without additional authorizations if they have been tested and granted under the same intended end - use operational conditions, including simultaneous transmission operations. When they have not been tested and granted in this manner, additional testing and/or FCC application filing may be required. The most straightforward approach to address additional testing conditions is to have the grantee responsible for the certification of at least one of the modules submit a permissive change application. When having a module grantee file a permissive change is not practical or feasible, the following guidance provides some additional options for host manufacturers. Integrations using modules where additional testing and/or FCC application filing(s) may be required are: (A) a module used in devices requiring additional RF exposure compliance information (e.g., MPE evaluation or SAR testing); (B) limited and/or split modules not meeting all of the module requirements; and (C) simultaneous transmissions for independent collocated transmitters not previously granted together. This Module is full modular approval, it is limited to OEM installation ONLY. Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change. (OEM) Integrator has to assure compliance of the entire end product include the integrated Module.

Additional measurements (15B) and/or equipment authorizations (e.g. Verification) may need to be addressed depending on co-location or simultaneous transmission issues if applicable. (OEM) Integrator is reminded to assure that these installation instructions will not be made available to the end user.

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01

2.2 List of applicable FCC rules

FCC Part 15 Subpart C 15.247 & 15.207 & 15.209 & 15.205

FCC Part 15 Subpart E 15.407

2.3 Specific operational use conditions

When installed in smart terminal products, the host manufacturer must negotiate with the module manufacturer on the final installation method in the system. The module can be used for mobile applications with a maximum 3.16 dBi antenna. The host manufacturer installing this module into their product must ensure that the final product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation. The host manufacturer has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as shown in this manual.

The module should be installed and operated with minimum distance 20cm between the radiator & your body. and if RF exposure statement or module layout is changed, then the host product manufacturer required to take responsibility of the module through a change in FCC ID or new application. The FCC ID of the module cannot be used on the final product. In these circumstances, the host manufacturer will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization. When the host is a portable device, it is necessary to take a SAR test with your set mounting this module. Class II permissive change application is necessary using the SAR report. Please contact kevin (kevin@sziton.com). And an application for a Class II permissive change from a Mobile equipment to a Portable equipment is also required.

Note) Portable equipment : Equipment for which the spaces between human body and antenna are used within 20cm. Mobile equipment : Equipment used at position in which the spaces between human body and antenna exceeded 20cm.

1. According to the following requirements of the power supply DC3.3V, power up, about 3 seconds to complete the initial.
2. iPhone/Android mobile phone BT/WIFI function to open, search to the corresponding Wireless network adapter name (name can be changed according to customer production requirements), click the name of the BT/WIFI and select the connection.
3. open application software (need to install the company's specific application software development, application software interface can be customized according to customer's product requirements).

2.4 Limited module procedures

The module is a Single module.

Requirement per 15.212 and KDB 996369 D01	Explanation from Grantee (do not write yes/no, but explain why product complies/how it is achieved)
The radio elements must have the radio frequency circuitry shielded. Physical components and tuning capacitor(s) may be located external to the shield, but must be on the module assembly.	Has RF shielding.
The module must have buffered modulation/data inputs to ensure that the device will comply with Part 15 requirements with any type of input signal.	The modular have buffered modulation/data inputs.
The module must contain power supply regulation on the module.	The modular transmitter have its own power supply regulation.(DC 3.3V)
The module must contain a permanently attached antenna, or contain a unique antenna connector, and be marketed and operated only with specific antenna(s), per §§ 15.203, 15.204(b), 15.204(c), 15.212(a), 2.929(b).	Antenna restrictions are added in the manual.The antenna needs to be professionally installed.
The module must demonstrate compliance in a stand-alone configuration.	The module was tested in a stand-alone configuration, please refer to the Setup Photo for the detail
The module must be labeled with its permanently affixed FCC ID label, or use an electronic display (see KDB Publication 784748).	Please refer to label sample exhibit - host labeling is described in integration manual
The module must comply with all specific rules applicable to the transmitter, including all the conditions provided in the integration instructions by the grantee.	The required FCC rule has been fulfilled and all the instructions for the maintaining compliance have been clearly stated in the User Manual.
The module must comply with RF exposure requirements	The MPE evaluation with 20cm distance restriction is submitted for the compliance of RF Exposure requirement.

2.5 Trace antenna designs

Please perform the Trace antenna design that followed the specifications of the antenna.

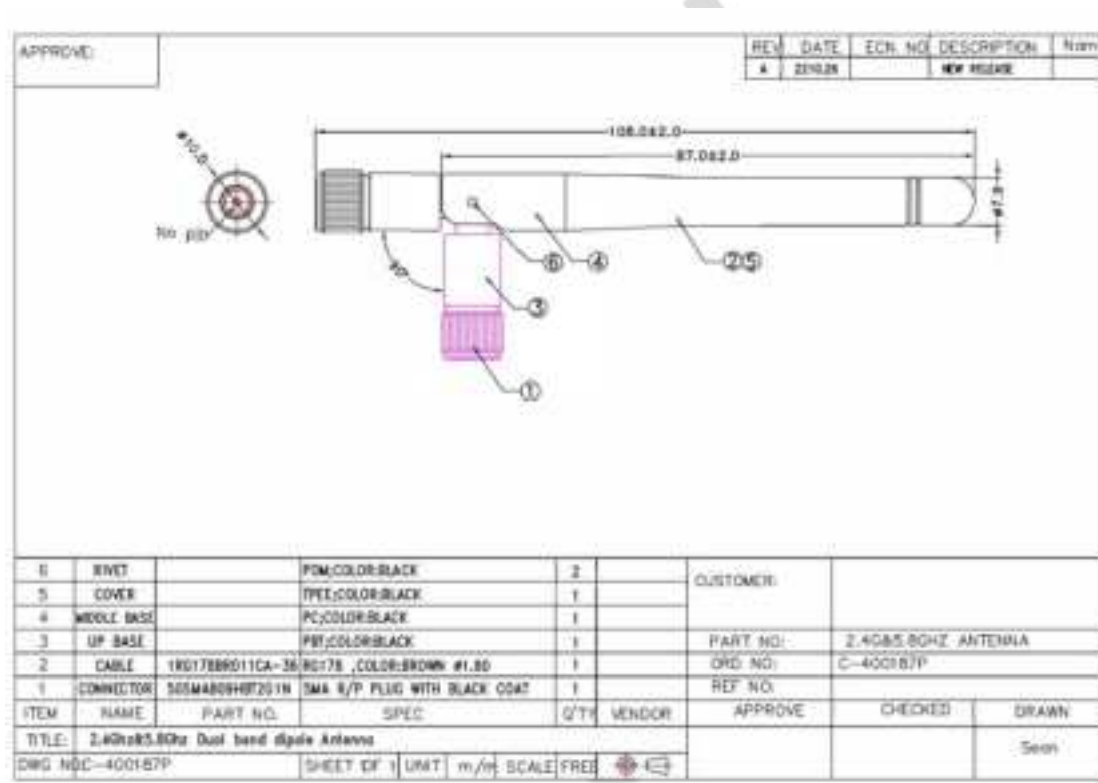
The concrete contents of a check are the following three points.

- 1) It is the same type as the antenna type of antenna specifications. Confirm the same size as the Gerber file.
- 2) An antenna gain is lower than a gain given in antenna specifications. Measure the gain, and confirm the peak gain is less than 3.16dBi.
- 3) The emission level is not getting worse. Measure the spurious, and confirm degradation of less than 3dB than spurious value of worst of report used for the application.

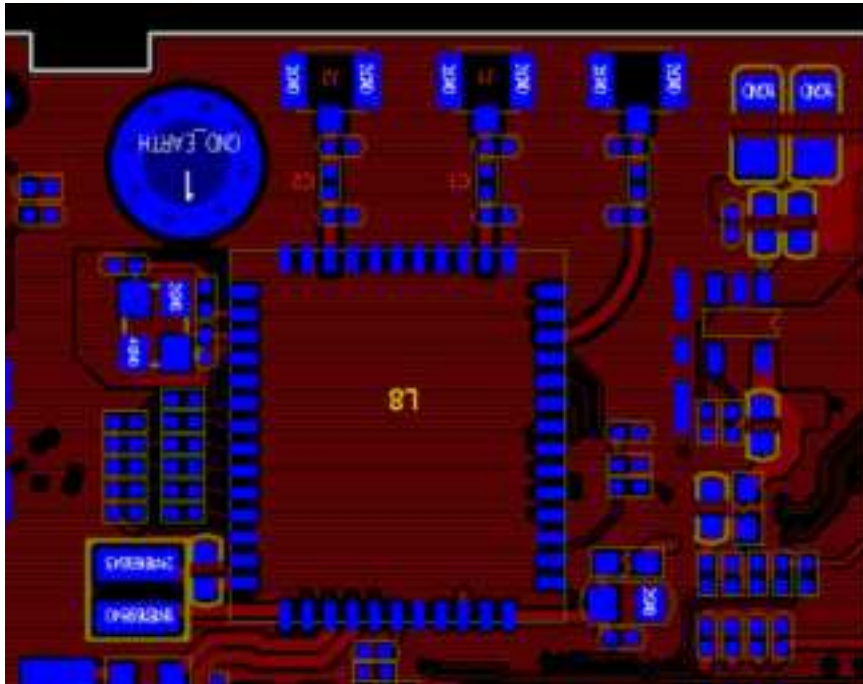
Dipole Antenna specification

You can see antenna size is $108 \pm 2\text{mm} \times 7.9\text{mm}$ From below

Specification.



Please refer to the chart below for PCB size of RF line terminal.



Scrape a GND off the side of the J1&J2,connect the monopole antenna to the PCB at the position of the J1&J2 connector.[The line between the monopole antenna and the WiFi module] must be 50 ohm.

C1&C2 is 10pF Capacitors.

2.6 RF exposure considerations

The module complies with FCC radiation exposure limits set forth for an uncontrolled environment.The module should be installed and operated with minimum distance 20cm between the radiator & your body.

2.7 Antennas

This module has been approved to operate with the antenna types listed below, with the maximum permissible gain indicated.The module antenna requires professional installation, and the antenna type cannot be changed. The gain cannot exceed 3.16dBi.

Frequency band	Antenna Type	Model Number	Max Gain
2400-2500MHz	Dipole Antenna	N1911	2.53(dBi)
5150~5250MHz	Dipole Antenna	N1911	1.87(dBi)
5250~5350MHz	Dipole Antenna	N1911	2.11(dBi)
5470~5725MHz	Dipole Antenna	N1911	2.93(dBi)
5725~5850MHz	Dipole Antenna	N1911	3.16(dBi)

This device is intended only for host manufacturers under the following conditions: The transmitter module may not be co-located with any other transmitter or antenna; The module shall be only used with the External antenna(s) that has been originally tested and certified with this module. The antenna must be either permanently attached or employ a 'unique' antenna coupler.

As long as the conditions above are met, further transmitter test will not be required. However, the host manufacturer is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

2.8 Label and compliance information

Host product manufacturers need to provide a physical or e-label stating

"Contains FCC ID: VYVBW3752-50B1 With their finished product."

2.9 Information on test modes and additional testing requirements

The module complies with FCC radiation exposure limits set forth for an uncontrolled environment. The module should be installed and operated with minimum distance 20cm between the radiator & your body. and if RF exposure statement or module layout is changed, then the host product manufacturer required to take responsibility of the module through a change in FCC ID or new application. The FCC ID of the module cannot be used on the final product. In these circumstances, the host manufacturer will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization. When the host is a portable device, it is necessary to take a SAR test with your set mounting this module. Class II permissive change application is necessary using the SAR report. Please contact kevin (kevin@sziton.com). And an application for a Class II permissive change from a Mobile equipment to a Portable equipment is also required.

Note) Portable equipment : Equipment for which the spaces between human body and antenna are used within 20cm. Mobile equipment : Equipment used at position in which the spaces between human body and antenna exceeded 20cm.

Host manufacturer must perform test of radiated & conducted emission and spurious emission, etc according to the actual test modes for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

Only when all the test results of test modes comply with FCC requirements, then the end product can be sold legally.

2.10 Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for FCC Part 15 Subpart C 15.247 & 15.407 & 15.207 & 15.209 & 15.205 and that the host product manufacturer is responsible for compliance

to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

2.11 The user manual of the end product should include:

- a) Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.
- b) The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons.
- c) This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
- d) This device is restricted to indoor use.
- e) The antenna(s) used for this transmitter must not transmit simultaneously with any other antenna or transmitter.